Our Reference: 100204895-1 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants:	Peter Mardilovich et al.
Serial Number:	10/691,199
Filing Date:	October 22, 2003
Confirmation Number:	5652
Examiner/Group Art Unit:	Bret P. Chen/1792
Title:	METHODS OF MAKING POROUS CERMET AND CERAMIC FILMS

APPEAL BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Please enter the following Appeal Brief in the appeal filed February 28, 2008.

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest is Hewlett-Packard Development Company, L.P., a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249, Houston, Texas 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

II. RELATED APPEALS AND INTERFERENCES

Appellants and the undersigned attorney are not aware of any appeals or any interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-33 and 44-48 are the claims on appeal. *See,* Appendix.

Claims 34-43 were cancelled.

Claim 48 was rejected under 35 U.S.C. § 112, first paragraph.

Claims 1-33, 44-46 and 48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Darolia et al. (U.S. Patent Pub. No. 2003/0152797, referred to herein as “Darolia”).

Claim 47 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Darolia in view of Hackh’s Chemical Dictionary.

IV. STATUS OF AMENDMENTS

In response to the Final Office Action of November 28, 2007, no amendment pursuant to 37 C.F.R. § 1.116 was filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

In this summary of claimed subject matter, all citations are to the specification of United States Patent Application Number 10/691,199. Further, all citations are illustrative, and support for the cited element may be found elsewhere in the specification.

Independent Claim 1:

One embodiment provides a method for making a porous film. The method includes causing a mobile metal to diffuse to at least one of a cermet film surface and a ceramic film surface, thereby rendering the porous film. The at least one of the cermet film and the ceramic film are formed by co-depositing a metal and a ceramic on a substrate, wherein the co-deposited metal is the source of the mobile metal (see page 7, line 24 through page 8, line 4 and Figs. 1 and 2).

Dependent Claim 4:

In an embodiment of the method as set forth in independent claim 1, the ceramic is at least one of nickel oxides, platinum oxides, Ni-YSZ, Cu-YSZ, Ni-SDC, Ni-GDC, Cu-SDC, Cu-GDC, silver oxides, samarium strontium cobalt oxide (SSCO, $Sm_xSr_yCoO_{3-\delta}$), barium lanthanum cobalt oxide (BLCO, $Ba_xLa_yCoO_{3-\delta}$), gadolinium strontium cobalt oxide (GSCO, $Gd_xSr_yCoO_{3-\delta}$), lanthanum strontium manganite ($La_xSr_yMnO_3$), lanthanum strontium cobalt ferrite ($La_wSr_xCo_yFe_zO_3$), and mixtures thereof (see page 5, lines 9-22).

Independent Claim 21:

Another embodiment of the method for making a porous film includes co-depositing a metal and a ceramic on a substrate, thereby forming at least one of a cermet film and a ceramic film; and subjecting the at least one of the cermet film and the ceramic film to conditions such that the metal therein reduces. At least a portion of the metal diffuses to a surface of the at least one of the cermet film and the ceramic film, thereby forming at least one of a porous ceramic film and a porous cermet film (see page 6, lines 3-10; page 9, line 28 through page 10, line 8; and Figures 3A and 3B).

Dependent Claim 23:

In an embodiment of the method as set forth in independent claim 21, the ceramic is at least one of nickel oxides, platinum oxides, Ni-YSZ, Cu-YSZ, Ni-SDC, Ni-GDC, Cu-SDC, Cu-GDC, silver oxides, samarium strontium cobalt oxide (SSCO, $Sm_xSr_yCoO_{3-\delta}$), barium lanthanum cobalt oxide (BLCO, $Ba_xLa_yCoO_{3-\delta}$), gadolinium strontium cobalt oxide (GSCO, $Gd_xSr_yCoO_{3-\delta}$), lanthanum strontium manganite ($La_xSr_yMnO_{3-\delta}$), lanthanum strontium cobalt ferrite ($La_wSr_xCo_yFe_zO_{3-\delta}$), and mixtures thereof (see page 5, lines 9-22).

Independent Claim 32:

Still another embodiment of the method for making a porous film includes co-depositing a highly mobile metal and a ceramic on a substrate, thereby forming a cermet film; and subjecting the cermet film to annealing, wherein the highly mobile metal diffuses to and agglomerates on the cermet film surface, thereby forming a porous ceramic film (see page 6, lines 3-10; page 7, line 17 through page 8, line 4; page 9, lines 7-26; and Figure 2).

Independent Claim 44:

Yet another embodiment of a method for making a porous film includes forming the porous film by at least one of reducing a metal within at least one of a cermet film and a ceramic film, and causing the metal to diffuse to at least one of a surface of the cermet film and a surface of the ceramic film. The at least one of the cermet film and the ceramic film having been formed by depositing at least one metal-containing material on a substrate, wherein the at least one metal-containing material contains the metal (see page 6, lines 3-10; and page 9, line 28 through page 10, line 8 and Figs. 1 and 2).

Dependent Claim 47:

In an embodiment of the method as set forth in independent claim 1, the metal is at least one of gold, nickel, copper, silver, alloys thereof, and mixtures thereof (see page 4, lines 14-20).

Dependent Claim 48:

In an embodiment of the method as set forth in dependent claim 6, which depends from claim 1, the annealing temperature takes place at a temperature ranging from 344°C to 590°C (see page 6, line 17 through page 7, line 5).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claim 48 is unpatentable under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

Whether claims 1-33, 44-46 and 48 are unpatentable under 35 U.S.C. §103(a) as being obvious in view of Darolia.

Whether claim 47 is unpatentable under 35 U.S.C. 103(a) as being obvious in view of Darolia and Hackh's Chemical Dictionary.

VII. ARGUMENTS

A. Rejection of Claim 48 under 35 U.S.C. §112, first paragraph

In the Final Office Action dated November 28, 2007, claim 48 was rejected under 35 U.S.C. §112, first paragraph, as failing to comply with written description requirement. The Examiner stated that the temperature range of "344° and 590°" is deemed new matter as there is no support for the range in the specification as filed.

Appellants respectfully disagree with the Examiner, and submit that support for the claimed range may be found throughout the specification as filed, at least at page 6, line 17 through page 7, line 5. In the specification as filed, the Appellants explain that the Tamman temperature of a metal is the temperature at about which the metal becomes significantly more mobile (see page 6, lines 17-26). Furthermore, Appellants explain that annealing may be used to cause the mobile metal to diffuse (see page 7, line 27 through page 8, line 4). In light of these descriptions, it is submitted that one skilled in the art would recognize that the Tamman temperature may be used as the annealing temperature to achieve metal mobility. Examples of the Tamman temperature of various metals are provided in the chart on page 7 of the specification as filed (reproduced hereinbelow), and the range set forth in claim 48 is extrapolated from the chart (see the values in bold font below).

	Melting T (°C)	Tamman T (°C)
Cu	1083	405
Ni	1453	**590**
Au	1064	396
Ag	962	**344**
Pd	1552	639
Pt	1772	749

Appellants' specification as filed clearly sets forth the temperatures of the range recited in claim 48, and temperatures within the range. For all the reasons stated above, it is submitted that Appellants' range is not deemed new matter and is fully supported by the specification as filed. As such, withdrawal of the rejection of claim 48 under 35 U.S.C. §112, first paragraph is respectfully requested.

B. <u>Rejection of Claims 1-33, 44-46 and 48 under 35 U.S.C. §103(a)</u>

a. Claims 1-3, 5-22, 24-33, 44-46 and 48

In the Final Office Action dated November 28, 2007, claims 1-34 and 44-46 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Darolia. According to the Examiner, Darolia discloses a method of forming a thermal barrier coating (referred to hereinafter as "TBC") system by co-depositing first and second ceramic compositions. The Examiner further states that in one embodiment, a platinum-group metal may be co-deposited with the first and second ceramic compositions, or deposited before the TBC and subsequently diffused into the outer portion.

The Examiner admits that the reference remains silent on making a porous film. However, it is the Examiner's position that since Darolia teaches 1) co-depositing ceramic and metal, and 2) metal diffusion, the ability to make a porous film would be inherent to Darolia's process.

Appellants respectfully disagree with the Examiner's conclusions regarding Darolia. Appellants' invention as defined in the pending claims includes a mobile metal diffusing **to at least one of a cermet film *surface* and a ceramic film *surface***, thereby rendering the porous film.

In the response to the Appellants' arguments filed on September 12, 2007, the Examiner states that the outer portion of Darolia reads on the Appellants' claimed surface. Appellants strongly disagree with this conclusion, and direct the Board's attention to Fig. 3 of Darolia (reproduced hereinbelow), which illustrates the TBC 26 including inner portion 30 and outer portion 32.

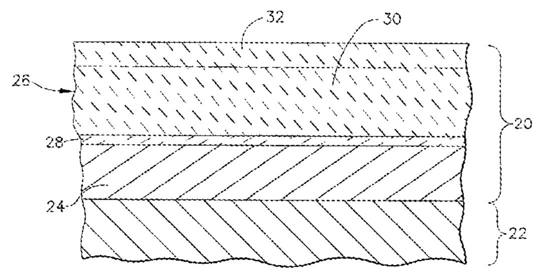

FIG. 3

Figure 3 of Darolia

As depicted in Fig. 3, the outer portion 32 is the outermost layer of the TBC 26. While the outer portion 32 does form a surface of the TBC 26, Darolia specifically teaches that a platinum-group metal is present ***within*** the outer portion 32 of the TBC 26, not ***on a surface*** of the outer portion 32. In one embodiment, Darolia teaches that the metal is co-deposited with a ceramic to form the outer portion 32 (see paragraph [0025]). In another embodiment, Darolia teaches that the metal is introduced into the outer portion 32 via diffusion through the inner portion 30 of the TBC 26 and into the outer portion 32 (see paragraph [0025]). In both of Darolia's methods, the result is that the metal is located **IN the outer portion**, **NOT ON a surface of the outer portion**.

It is submitted that the teachings of Darolia do not render obvious the invention as defined in Appellants' claims, which includes diffusing the mobile metal *to the surface to form pores* within the film from which the metal is diffused. In fact, Appellants strongly disagree with the Examiner's conclusion that it would be inherent to form pores in the TBC of Darolia. The stated purpose of Darolia is to provide a barrier coating that is resistant to infiltration by CMAS and other potential high-temperature contaminants (see paragraph [0011]). Further, the second ceramic composition of Darolia is selected to increase the resistance of the outer portion of the TBC by interacting with molten CMAS to form a reaction product that re-solidifies before it can fully infiltrate the TBC (see paragraph [0012]).

Appellants submit that complete diffusion of the metal to the surface of the outer portion to form pores within the TBC is **directly contrary** to the stated purpose of the TBC. If one skilled in the art were to form pores within the TBC, CMAS or other

contaminants would be able to enter the pores and infiltrate the TBC. Infiltration of these contaminants would <u>destroy the stated purpose</u> of the system (which is to be resistant to such infiltration). In contrast to the Examiner's conclusion, Appellants submit that it would **not** be inherent to form pores in the TBC of Darolia.

For all the reasons stated above, it is submitted that Appellants' invention as defined in independent claims 1, 21, 32 and 44, and in those claims depending ultimately therefrom, is not anticipated, taught or rendered obvious by Darolia, either alone or in combination, and patentably defines over the art of record.

b. Claims 4 and 23

Appellants reiterate all of the arguments previously set forth regarding the patentability of independent claims 1 and 21, from which claims 4 and 23 respectively depend. Appellants submit that claims 4 and 23 are patentable at least for these reasons.

It is further submitted that Darolia does not teach, suggest or render obvious the ceramic materials set forth in claims 4 and 23. Darolia teaches that the base ceramic material is YSZ, nonstabilized zirconia, zirconia partially or fully stabilized by magnesia, ceria, scandia or other oxides (see paragraph [0022]). Darolia also teaches that the additional ceramic material is alumina, silica, scandia, calcium zirconate, spinels, magnesia, calcia, and chromia (see paragraphs [0022] and 0009]). Appellants' claims 4 and 23 recite different ceramic materials. As chemistry is an unpredictable art, it is submitted that the behavior of the ceramic materials (or metals contained therein) of Appellants' claims cannot be predicted by the materials disclosed in Darolia.

For all the reasons stated above, it is submitted that Appellants' invention as defined in claims 4 and 23 is not anticipated, taught or rendered obvious by Darolia, either alone or in combination, and patentably defines over the art of record.

C. Rejection of Claim 47 under 35 U.S.C. §103(a)

In the Final Office Action dated November 28, 2007, claim 47 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Darolia. According to the Examiner, Darolia teaches a method of forming the TBC by diffusing a platinum group metal from a co-deposited ceramic composition. The Examiner admits that the reference fails to teach gold, nickel, copper or silver as possible metals that diffuse. The Examiner points out that the background of Darolia notes that noble metals, such as platinum, may be utilized. The Examiner concludes that it would have been obvious to incorporate other noble metals as defined by Hackh's Chemical Dictionary with the expectation of obtaining similar results.

At the outset, Appellants reiterate the arguments set forth hereinabove regarding the patentability of independent claim 1, from which claim 47 depends. Appellants submit that claim 47 is patentable at least for these reasons.

Furthermore, in the description of the related art, Darolia does suggest that other noble metals may be used as impermeable coatings to inhibit infiltration of molten CMAS (see paragraph [0009]). Darolia does not, however, teach or suggest that other noble metals may be used in place of the platinum group metals in the outer portion. In fact, it is submitted that since Darolia knew that other noble metals were suitable for use as impermeable coatings, he would have included such noble metals as alternatives for the platinum group metals if such other noble metals were considered to be a viable alternative. Since Darolia specifically did not include such other noble metals in the description of his invention, Appellants' submit that such a substitution would not have been obvious in view of the teachings of Darolia.

For all the reasons stated above, it is submitted that Appellants' invention as defined in claim 47 is not anticipated, taught or rendered obvious by Darolia, either alone or in combination, and patentably defines over the art of record.

SUMMARY

The Appellants respectfully submit that claims 1-33 and 44-48 as currently pending fully satisfy the requirements of 35 U.S.C. §§ 102, 103 and 112. In view of the foregoing, favorable consideration and passage to issue of the present application is respectfully requested. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

DIERKER & ASSOCIATES, P.C.

/Julia Church Dierker/

Julia Church Dierker
Attorney for Appellants
Registration No. 33368
(248) 649-9900, ext. 25
juliad@troypatent.com

3331 West Big Beaver Rd., Suite 109
Troy, Michigan 48084-2813

Dated: April 25, 2008

JCD/JRK/slc/jo

VIII. CLAIMS APPENDIX

1. (Previously presented) A method for making a porous film, comprising the step of:

causing a mobile metal to diffuse to at least one of a cermet film surface and a ceramic film surface, thereby rendering the porous film, the at least one of the cermet film and the ceramic film having been formed by co-depositing a metal and a ceramic on a substrate, wherein the co-deposited metal is the source of the mobile metal.

2. (Original) The method as defined in claim 1 wherein the co-depositing of the metal and the ceramic is accomplished by at least one of physical vapor deposition, chemical vapor deposition, atomic layer deposition, and angle deposition.

3. (Original) The method as defined in claim 1 wherein the metal is at least one of gold, nickel, platinum, copper, palladium, silver, rhodium, ruthenium, alloys thereof, and mixtures thereof.

4. (Original) The method as defined in claim 1 wherein the ceramic is at least one of nickel oxides, platinum oxides, Ni-YSZ, Cu-YSZ, Ni-SDC, Ni-GDC, Cu-SDC, Cu-GDC, silver oxides, samarium strontium cobalt oxide (SSCO, $Sm_xSr_yCoO_{3-\delta}$), barium lanthanum cobalt oxide (BLCO, $Ba_xLa_yCoO_{3-\delta}$), gadolinium strontium cobalt oxide (GSCO, $Gd_xSr_yCoO_{3-\delta}$), lanthanum strontium manganite ($La_xSr_yMnO_3$), lanthanum strontium cobalt ferrite ($La_wSr_xCo_yFe_zO_3$), and mixtures thereof.

5. (Original) The method as defined in claim 1 wherein the substrate is at least one of single crystal silicon, polycrystalline silicon, silica on silicon, thermal oxide on silicon, alumina, sapphire, ceramic, cubic fluorites, doped cubic fluorites, proton-exchange ceramics, yttria-stabilized zirconia (YSZ), samarium doped-ceria (SDC, $Ce_xSm_yO_{2-\delta}$), gadolinium doped-ceria (GDC, $Ce_xGd_yO_{2-\delta}$), $La_aSr_bGa_cMg_dO_{3-\delta}$, and mixtures thereof.

6. (Original) The method as defined in claim 1 wherein the causing step is accomplished by subjecting the at least one of the cermet film and the ceramic film to at least one of annealing and sintering.

7. (Original) The method as defined in claim 6 wherein the at least one of annealing and sintering occurs at a temperature between about 750°C and about 1000°C.

8. (Original) The method as defined in claim 6 wherein the metal is gold and the ceramic is samarium strontium cobalt oxide, and wherein the causing step is accomplished by annealing.

9. (Original) The method as defined in claim 8 wherein annealing takes place at a temperature ranging between about 750˚C and about 850˚C.

10. (Original) The method as defined in claim 9 wherein the gold agglomerates on the cermet film surface.

11. (Original) The method as defined in claim 6 wherein the metal is rendered mobile by subjecting the at least one of the cermet film and the ceramic film to reduction.

12. (Original) The method as defined in claim 11 wherein the metal is nickel and the ceramic is samarium doped cerium, and wherein the causing step is accomplished by annealing.

13. (Original) The method as defined in claim 12 wherein nickel is rendered mobile by reduction.

14. (Original) The method as defined in claim 12 wherein the nickel is co-deposited in the presence of 5% oxygen.

15. (Previously presented) The method as defined in claim 14 wherein annealing results in a porous ceramic film having an amount of nickel agglomerated on a surface thereof, and an amount of nickel oxide remaining in the porous ceramic film, and wherein the method further comprises the step of subjecting the porous ceramic

film having nickel oxide therein to reduction in the presence of hydrogen to render a porous cermet film.

16. (Original) The method as defined in claim 15 wherein the amount of nickel agglomerated on the ceramic film surface is between about 0% and about 50% of the nickel co-deposited on the substrate.

17. (Original) The method as defined in claim 15 wherein the reduction takes place at a temperature of between about 400°C and 800°C.

18. (Original) The method as defined in claim 11 wherein the metal is platinum and the ceramic is samarium doped cerium, and wherein the causing step is accomplished by sintering.

19. (Original) The method as defined in claim 18 wherein the platinum is rendered mobile by reduction, and wherein the sintering causes a first amount of platinum which remains in the ceramic film to reduce, thereby rendering a porous cermet film, and wherein the sintering causes a second amount of platinum to agglomerate on the porous cermet film surface.

20. (Original) The method as defined in claim 19 wherein oxidation takes place in the presence of 5% oxygen.

21. (Previously presented) A method for making a porous film, comprising the steps of:

co-depositing a metal and a ceramic on a substrate, thereby forming at least one of a cermet film and a ceramic film; and

subjecting the at least one of the cermet film and the ceramic film to conditions such that the metal therein reduces, wherein at least a portion of the metal diffuses to a surface of the at least one of the cermet film and the ceramic film, thereby forming at least one of a porous ceramic film and a porous cermet film.

22. (Original) The method as defined in claim 21 wherein the metal is at least one of gold, nickel, platinum, copper, palladium, silver, rhodium, ruthenium, alloys thereof, and mixtures thereof.

23. (Original) The method as defined in claim 21 wherein the ceramic is at least one of nickel oxides, platinum oxides, Ni-YSZ, Cu-YSZ, Ni-SDC, Ni-GDC, Cu-SDC, Cu-GDC, silver oxides, samarium strontium cobalt oxide (SSCO, $Sm_xSr_yCoO_{3-\delta}$), barium lanthanum cobalt oxide (BLCO, $Ba_xLa_yCoO_{3-\delta}$), gadolinium strontium cobalt oxide (GSCO, $Gd_xSr_yCoO_{3-\delta}$), lanthanum strontium manganite ($La_xSr_yMnO_{3-\delta}$), lanthanum strontium cobalt ferrite ($La_wSr_xCo_yFe_zO_{3-\delta}$), and mixtures thereof.

24. (Original) The method as defined in claim 21 wherein the co-depositing of the metal and the ceramic is accomplished by at least one of physical vapor deposition, chemical vapor deposition, atomic layer deposition, and angle deposition.

25. (Original) The method as defined in claim 21 wherein the co-depositing step takes place in the presence of oxygen.

26. (Original) The method as defined in claim 21 wherein the metal is platinum.

27. (Original) The method as defined in claim 26 wherein the subjecting step is accomplished by sintering, wherein sintering causes a first amount of the platinum which remains in the ceramic film to reduce, thereby rendering a porous cermet film, and wherein the sintering causes a second amount of platinum to agglomerate on the porous cermet film surface.

28. (Original) The method as defined in claim 27 wherein sintering takes place at a temperature ranging between about 750°C and about 1000°C.

29. (Original) The method as defined in claim 21 wherein the metal is nickel.

30. (Original) The method as defined in claim 29 wherein the subjecting step comprises the steps of:

subjecting the ceramic film to annealing, the ceramic film having nickel oxide therein; and

subjecting the ceramic film having nickel oxide therein to reduction in the presence of hydrogen.

31. (Original) The method as defined in claim 30 wherein the reduction takes place at a temperature between about 400°C and about 800°C.

32. (Original) A method for making a porous film, comprising the steps of:

co-depositing a highly mobile metal and a ceramic on a substrate, thereby forming a cermet film; and

subjecting the cermet film to annealing, wherein the highly mobile metal diffuses to and agglomerates on the cermet film surface, thereby forming a porous ceramic film.

33. (Original) The method as defined in claim 32 wherein the highly mobile metal is gold.

34 – 43. (Canceled)

44. (Previously presented) A method for making a porous film, comprising the step of:

forming the porous film by at least one of reducing a metal within at least one of a cermet film and a ceramic film, and causing the metal to diffuse to at least one of a surface of the cermet film and a surface of the ceramic film, the at least one of the cermet film and the ceramic film having been formed by depositing at least one metal-containing material on a substrate, wherein the at least one metal-containing material contains the metal.

45. (Original) The method as defined in claim 44 wherein the at least one metal containing material is at least one of metals, metal oxides, ceramics, cermets, binary ceramics.

46. (Original) The method as defined in claim 44 wherein at least two of the metal-containing materials are co-deposited on the substrate.

47. (Previously presented) The method as defined in claim 1 wherein the metal is at least one of gold, nickel, copper, silver, alloys thereof, and mixtures thereof.

48. (Previously presented) The method as defined in claim 6 wherein annealing takes place at a temperature ranging from 344°C and 590°C.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.